National Institute of Environmental Health Sciences

Nitrogen cycle and ecosystem services in the Brazilian La Plata Basin: Anthropogenic influence and climate change

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Abstract:

The increasing human demand for food, raw material and energy has radically modified both the landscape and biogeochemical cycles in many river basins in the world. The interference of human activities on the Biosphere is so significant that it has doubled the amount of reactive nitrogen due to industrial fertiliser production (Haber-Bosch), fossil fuel burning and land-use change over the last century. In this context, the Brazilian La Plata Basin contributes to the alteration of the nitrogen cycle in South America because of its huge agricultural and grazing area that meets the demands of its large urban centres - Sao Paulo, for instance - and also external markets abroad. In this paper, we estimate the current inputs and outputs of anthropogenic nitrogen (in kg N.km(-2).yr(-1)) in the basin. In the results, we observe that soybean plays a very important role in the Brazilian La Plata, since it contributes with an annual entrance of about 1.8 TgN due to biological nitrogen fixation. Moreover, our estimate indicates that the export of soybean products accounts for roughly 1.0 TgN which is greater than the annual nitrogen riverine exports from Brazilian Parana, Paraguay and Uruguay rivers together. Complimentarily, we built future scenarios representing changes in the nitrogen cycle profile considering two scenarios of climate change for 2070-2100 (based on IPCC's A2 and B2) that will affect land-use, nitrogen inputs, and loss of such nutrients in the basin. Finally, we discuss how both scenarios will affect human well-being since there is a connection between nitrogen cycle and ecosystem services that affect local and global populations, such as food and fibre production and climate regulation.

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Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Special Report on Emissions Scenarios (SRES)

Special Report on Emissions Scenarios (SRES) Scenario: SRES A2, SRES B2

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Food/Water Quality

Food/Water Quality: Chemical

Geographic Feature:

resource focuses on specific type of geography

Other Geographical Feature

Other Geographical Feature : Basin

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Central/South America

Health Co-Benefit/Co–Harm (Adaption/Mitigation):

specification of beneficial or harmful impacts to health resulting from efforts to reduce or cope with greenhouse gases

A focus of content

Health Impact:

specification of health effect or disease related to climate change exposure

Mental Health/Stress, Morbidity/Mortality, Other Health Impact

Other Health Impact: Well-being

Intervention:

strategy to prepare for or reduce the impact of climate change on health

A focus of content

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Mitigation

Model/Methodology:

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Long-Term (>50 years)

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content